Wind Power Installation with at least two Components and a Data Network

The present invention relates to a wind power installation for generating electrical energy, with at least two components which respectively have sensors and actuators and comprise a control unit. At present, known wind power installations have a central automation system. This system has a central control system which controls the wind power installation via special hardware components, such as for example SPS and bus connections. In this connection, specific functions and specially adapted software are used which make use of a manufacturer-specific functional scope. It is therefore not possible to replace individual pieces of equipment easily in the wind power installation. An alteration to one component necessitates complex alterations to the control system.

The object of the invention is to provide a wind power installation, in the control system of which no, or only small, adaptations are required when replacing individual parts of the wind power installation.

According to the invention, the object is achieved by a wind power installation with the features of claim 1. Advantageous embodiments form the subject of the sub-claims.

The wind power installation according to the invention consists of at least two components which respectively have

sensors and actuators. Each of the control units is connected to a data network for the exchange of data and signals. Each component exchanges with the other components, signals for the operating conditions of the component, detected sensor values and/or control signals for the other components via the control unit associated with said component.

In the wind power installation according to the invention, a central control system is dispensed with. The control system is based on the individual components. This approach of a component-based control system of the wind power installation is based on the recognition that the signal exchange between the components is sufficient for controlling a wind power installation and does not require a central control system but can be modularised without loss of speed and accuracy. With the construction of the wind power installation according to the invention, individually occurring operating conditions of the components are controlled according to specific parameters for the components. The communication of the operating conditions between the components, however, is carried out irrespective of specific parameters. A consequence of this is that components from different manufacturers can be interchanged, without alterations being required to the control routines of the other components.

In a preferred embodiment each component is exclusively controlled by the control unit associated therewith. In

this embodiment, a control system is avoided where a control unit directly controls a component not associated therewith.

A drive train unit and an electrical unit are preferably provided as components of the wind power installation. Each of these units has an individual control system which exchanges data with other control systems. In this connection, measured values in the components can naturally also be exchanged with one another.

It has been shown that the drive train unit can be split into further independent units. The drive train unit comprises a braking unit, a shaft unit, a generator unit or combinations of these units. In addition, the drive train can be provided with a gear box.

The electrical unit is expediently split into one or more independent units. In this connection, a grid connection unit, a converter unit, a transformer unit or a combination of these units prove to be expedient as units.

In wind power installations, whether offshore or on land, it is expedient to provide additionally a tower unit. The tower unit consists of a heating unit, a lifting unit, an access control unit or combinations of these units.

In order to ensure the communication between the units, it has proven to be expedient to use an ether network or a fieldbus network.

The wind power installation according to the invention will be described hereinafter in more detail with reference to a sketch.

The only sketch shows the diagrammatic construction of a wind power installation. The rotor blades 10 shown have a pitch control 12 for adjusting the rotor blade angle. The rotor shaft 14 terminates in a gear box 16. The output shaft of the gear box is additionally provided with a braking system 18 and terminates in a generator 20. The electrical energy generated by the generator 20 is adapted in a converter 22 to the grid requirements and fed via the connector 24 into the grid system 26. A cooling system 28 and an azimuthal drive 30 are additionally provided in the nacelle.

Further components, for example for the monitoring and diagnosis of the operation, can be provided in the nacelle.

All components are connected to an ether network 30, via which data and signals can be received and transmitted for other components.

In the wind power installation according to the invention, the necessary control system is present on the main

components to automate the entire system. In this connection, the advantage is that the interfaces with all component suppliers are clearly defined and the components communicate with one another via the defined interfaces. This results in the components being able to be replaced quickly and inexpensively irrespective of individual suppliers. Moreover, it is advantageous that signals can be incorporated therewith to monitor the components.

Claims

1. Wind power installation for generating electrical energy with at least two components (8, 12, 14, 16, 18, 20, 22, 24, 28, 30) which respectively have sensors and/or actuators and comprise a control unit, each of the control units being connected to a data network (30) and exchanging with the control units of the other components, signals for the operating conditions of the components, detected sensor values and/or control signals for the other components.

2. Wind power installation according to claim 1, characterised in that each control unit of a component exclusively controls said component.

3. Wind power installation according to claim 2, characterised in that a drive train unit (12, 16, 18) and an electrical unit (20, 22, 24) are provided as components.

4. Wind power installation according to claim 3, characterised in that the drive train unit comprises one or more of the following units as independent units:

Braking unit (18), shaft unit (14), generator unit (20).

5. Wind power installation according to claim 4, characterised in that the drive train additionally comprises a gear box (16).

6. Wind power installation according to any one of claims 1 to 3, characterised in that the electrical unit comprises one or more of the following units as independent units:

Grid connection unit (24), converter unit (22), transformer unit.

7. Wind power installation according to any one of claims 1 to 6, characterised in that a tower unit is provided as an additional component.

8. Wind power installation according to claim 7, characterised in that the tower unit has one or more of the following units as components:

as equipment, lifting device and access control device.

9. Wind power installation according to any one of claims 1 to 8, characterised in that an ether network (30) is provided as a data network.

10. Wind power installation according to any one of claims 1 to 8, characterised in that a fieldbus network is provided as a data network.

Abstract

Wind power installation for generating electrical energy with at least two components which respectively have sensors and actuators and comprise a control unit, each of the control units being connected to a data network and exchanging with the control units of the other components, signals for the operating conditions of the components, detected sensor values and/or control signals for the other components.